RESPONSE TO THE SECRETARIAL INITIATIVES ON THE HANFORD EXPLOSION

OAK RIDGE OPERATIONS

SITE: OAK RIDGE NATIONAL LABORATORY

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EXECUTIVE SUMMARY

This report responds to the initiatives identified by the Secretary of the Department of Energy (DOE) in his letter of August 4, 1997 concerning the chemical explosion at Hanford. The letter identified four initiatives which are summarized as:

Scrutinize the use, storage, and disposal of hazardous chemicals.
1. Report on known and found vulnerabilities.
2. Assess technical competence and training.
3. Address the Lessons Learned and Occurrence Reporting programs.

This report addresses these initiatives for Oak Ridge National Laboratory (ORNL). ORNL is managed by Lockheed Martin Energy Research Corporation (LMER) for the U. S. Department of Energy (DOE). The ORNL site also includes facilities in DOE's Environmental Management program which are managed by Lockheed Martin Energy Systems (LMES). These facilities are included in this report. Additionally, ORNL operates certain facilities at the Y-12 site and these facilities are also included in the scope of this report.

ORNL has reviewed its use, storage, and disposal of hazardous chemicals. This included its current programs for control of hazardous chemicals and self-assessment activities for the effectiveness of those controls. Special walkdowns were conducted in the waste management area to examine hazardous chemical and waste storage. Known chemical and radiological vulnerabilities were reassessed and the evaluation reported. Training was examined and the Lessons Learned and Occurrence Reporting systems were addressed. Possible vulnerabilities were identified in waste management associated with:
Existing waste characterization data are inadequate for determining the most appropriate treatment, storage and disposal options for waste streams and for assessing chemical compatibility.
Unproven waste/container compatibility.
1. Compatibility of co-stored waste.
2. Disposal of mixed shock-sensitive waste.
3. Wastes are stored in facilities not designed for that purpose.
4. Quantities of wastes are stored long term.

Also, ORNL had recently identified opportunities for improvement in its Environment, Safety, and Health (ES&H) programs. These five improvement areas support the Secretary's initiatives coming from the Hanford event. The opportunities for improvement are: strengthen line management accountability for ES&H requirements, strengthen compliance training and qualification, strengthen self-assessment, improve ES&H issues management tracking, and establish an Integrated Safety Management System (ISMS). ISMS supports improved chemical safety because of its function to

accomplish work safely with a clear understanding of all hazards and hazard controls.

Several accomplishments have reduced chemical hazard vulnerabilities at ORNL. Notable among these are: (1) in the past year, over 70,000 pounds of hazardous waste has been shipped to an off-site vendor for disposal (a moratorium had been imposed on this activity since 1991); (2) over 8,000 pounds of hazardous waste was received into waste management from the ORNL operating divisions; (3) several tons of sodium is being removed from shutdown experiments and shipped off-site; (4) all known (40 total) perchloric acid contaminated hood systems have been decontaminated and deconstructed for this shock-sensitive hazard; (5)virtually all solvent parts washing has been converted to aqueous processing; (6) wet chemical photographic processes are being converted to digital imaging with no waste products; and (7)Between Use Storage (BUS) Areas have been successfully piloted to reduce new chemical procurement and waste generation.

Safety improvements attributable to this Secretarial initiative will be: (1) those actions that come from the identified possible vulnerabilities in waste management; (2) improvement in ORNL's continuing self-assessment for chemical safety problems; and (3) increased general awareness of chemical safety issues and the need to continually reduce chemical hazards and wastes.

ORNL was founded in 1942 during the Manhattan Project. It is the largest of the U.S. Department of Energy's five multiprogram energy laboratories and has a current annual budget of more than $500 million. ORNL has a staff of about 5000 employees, plus more than 4000 visiting researchers. Major programs exist in energy conservation, materials development, magnetic fusion energy, nuclear safety, robotics and computing, biomedical and environmental sciences, medical radioisotope development, and basic chemistry and physics. It is home to sixteen uniquely equipped research facilities open to researchers from industry and universities.

The mission of the ORNL is to conduct basic and applied research and development (R&D) in order to advance the nation's energy resources, environmental quality, and scientific knowledge and to contribute to educational foundations and national economic competitiveness.

1. SCRUNITY OF USE, STORAGE, AND DISPOSAL OF HAZARDOUS CHEMICALS

1.1 Self-Assessment

Continuing self-assessment is the foundation of ORNL's ES&H performance including assurance of safety in the use, storage, and disposal of hazardous chemicals. This includes assessment by the line organization staff and management, and assistance and reviews by trained support personnel, especially the staff of the Office of Environmental Protection, the Office of Safety and Health Protection, and the Office of Operational Readiness and Facility Safety. Also, the Office of Quality Services manages the ORNL self-assessment program and receives summary reports from all divisions. A major, comprehensive ORNL self-assessment was recently completed using the Brookhaven National Laboratory Report Action Plan. This report, which was submitted to DOE in August 1997, identified five opportunities for improvement with corresponding issues and action items. Those five opportunities for improvement all directly relate to issues that are relevant to the initiatives in Secretary Peña's letter. Those five ORNL opportunities are:

1. Strengthen the DOE and ORNL line management roles and accountability for implementing environment, safety, and health requirements and initiatives.
2. Strengthen the ORNL compliance training qualifications programs.
3. Strengthen the DOE and ORNL self-assessment programs.
4. Establish an improved ES&H issues tracking management system to address the roles and responsibilities of various offices that fund work at ORNL.

Establish an ORNL Integrated Safety Management System (ISMS).

The action plan to respond to these opportunities for improvement is provided in the ORNL report.

ORNL performs examinations of all Laboratory divisions and offices on a 3-year cycle and focuses on all ES&H and Quality systems implemented within the assessed organization. This Environment, Safety, Health, and Quality Integrated Management Assessment is led by a division level manager from outside the assessed division and is staffed by subject matter experts.

Both Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) mandate inspections of areas where wastes are stored. ORNL Treatment, Storage, and Disposal (TSD) and RCRA 90-day accumulation areas are among the areas routinely inspected. These inspections are designed to identify malfunctions and deterioration, operator errors, or discharges before the problems create hazards to human health or the environment. Inspections are conducted daily, weekly,

biweekly, monthly, and/or annually; the frequency is based on the rate of deterioration of the equipment, the probability of an incident, or regulatory requirements.

The Waste Management and Remedial Actions Division (WMRAD) Self-Assessment Program has been developed and implemented in accordance with X-QA-10, *ORNL Self Assessment Programs*. The WMRAD Self-Assessment Program supports the WMRAD objective of continuous improvement for meeting requirements in all applicable areas of evaluation, including environment, safety, health, quality assurance, and conduct of operation standards. The criteria used as a basis for ES&H aspects of the WMRAD Self-Assessment Program include regulatory regimes with applicability to WMRAD facilities and operations and facility authorization basis (FAB) documentation. This documentation pertains to both nuclear and non-nuclear facilities. To the extent that physical infrastructure and safety systems are addressed by regulation or facility authorization basis documentation, the WMRAD Self-Assessment Program does identify any change in condition that may affect hazardous materials. Requirement units derived from FAB or from regulatory sources are periodically assessed by facility managers during walkdown inspections. Deficiencies are noted and corrective actions are taken to mitigate the deficiency. Infrastructure systems such as steam, firewater, and natural gas distribution systems, to the extent that are addressed in FAB or regulatory sources, are assessed during walkdown inspections.

Since its inception, a goal of the WMRAD at ORNL has been to conduct operations within FAB requirements; however, the rigor of compliance efforts intensified with the Defense Nuclear Facilities Safety Board (DNFSB) incident at Y-12 in September 1994. Specific actions that WMRAD has taken to assure compliance with FAB requirements include: (1) reviewing the categorization of each WMRAD facility; (2) assessing nuclear and radiological facilities; (3) identifying and assessing FAB requirements and the procedures which implement them; (4) developing a self-assessment program to ensure continued safe and compliant operations; (5) developing a configuration management program to ensure FAB requirements are maintained and updated; and (6) establishing Satellite Command Centers to ensure all workers have access to documents that dictate the specific operating, safety, health, and environmental requirements for their jobs. Completion of these actions/activities has enabled WMRAD to move from a knowledge based management approach for waste management operations to a standards based management approach.

Furthermore, WMRAD has developed, implemented, and completed actions/activities that satisfy the three actions requested in the November 21, 1995, letter from past DOE Undersecretary Thomas P. Grumbly. The first action, ensuring that the authorization basis for each nuclear facility is current, was completed October 16, 1995. The second action, determining whether the safety basis, comprised of assumptions and technical bases, is accurately reflected in each nuclear facility's operating procedures, has been

completed via the requirement unit (RU) identification and programmatic assessment process and through walkdowns of the FAB documents which were conducted by managers, workers, and outside parties as part of the Energy Systems Waste Management Organization (ESWMO) conduct of operations improvement activities. As facility managers conduct self-assessments utilizing the FAB RU checklists, adherence to the RUs are evaluated. These assessments determine if RUs contained in the procedures, programs, and plans are actually being implemented in the field and ensures that the procedures accurately reflect the FAB RUs. The third and final action, to ensure that a process is in place to review and incorporate, as appropriate, changes to the authorization basis, has been addressed via establishment of the Command Media Configuration Control Program.

The shutdown facilities within the Surveillance and Maintenance program receive routine periodic and specified inspections.

In summary, ORNL evaluates for chemical vulnerabilities on a continuing basis by a layered approach. The direct responsibility lies with the line organization having responsibility for the hazardous chemical. The line organization is charged with having and implementing a self-assessment plan to identify vulnerabilities on a continuing basis. As a second layer, the staff of the Operations, Environment, Safety, and Health directorate perform routine and continuing oversight assessments for compliance and identification of vulnerabilities. The third layer of continuing examination for vulnerabilities is the triennial ESH&Q Integrated Management Assessment of each ORNL division and office.

1.2 Process for purchase and disposal or storage

The Hazardous Material Information System (HMIS) is a comprehensive system designed to meet the health, safety, environmental, regulatory and management requirements of the Hazardous Material Management Program (HMMP). The system includes laboratory quantities of chemicals and radioactive material if there is an associated chemical hazard. HMIS consist of 4 modules.

1. The Hazardous Material Procurement Module provides for an up-front hazard evaluation of all material requisitions by Industrial Hygiene (exception is credit card and petty cash). HMIS interfaces with the Accelerated Vendor Inventory Delivery (AVID) system, Direct Charge procurement, and in-house stores system. The interface ensures that a Material Safety Data Sheet (MSDS) , Superfund Amendments and Reauthorization Act (SARA) information, and location of where the material will be used or stored, is provided at the time of the requisition of a hazardous material (HM). A transaction record of all HM receipts is electronically input into the HM

Inventory Module.

2. The Material Safety Data Sheet (MSDS) Module ensures that the MSDSs are matched to all hazardous material receipts and made readily available to employees. Real-time access to manufacturers' MSDSs is provided via image scanning and retrieval capabilities (fax server and PC imaging). Pertinent information, such as material ingredients and percentages, hazard warnings, and specific gravity are supplied to the HM Inventory Module.

3. The Contractor Module ensures that contractors provide HM inventory data and the associated MSDSs. The module electronically monitors contracts, generates delinquent notices to facilitate reporting and downloads the information to the HM Inventory Module for inclusion into regulatory reports (e.g. SARA 312).

4. The HM Inventory Module ensures that all hazardous material entering Energy System are tracked and managed. The Module automatically records all HM transactions into HM control areas. Authorized users can use a terminal to access and update their inventory (record usage and transfers of material) by material type, by item, or by using the bar code interface. Inventory reports provide information associated with various regulated lists and also allows reports to be generated for such categories as carcinogens, reproductive toxins and Environmental Protection Agency (EPA) Extremely Hazardous Substances.

Each division has a HMIS representative who is responsible for the implementation of HMIS for his division. Each control area (area where the material is used or stored) has a custodian and one or more alternates assigned with the responsibility of maintaining an up to date inventory. HMIS has a Returnable Cylinder System (RCS) which automatically adds and removes gas cylinders that come in through the AVID procurement system. Hazardous material inventories can also be set up on the Automatic Inventory Removal (AIR). AIR works by establishing a designated maximum amount of material that will be maintained in the control area and when the material is ordered and added to the control area through the procurement system HMIS automatically adjust inventory to the maximum inventory amount. AIR works well in bulk areas (tanks) and production areas. ORNL requires monthly updates to the inventory (some areas have been exempted based on low turn over of materials or low purchase activity). Activity (updates) of control areas can be monitored through the system.

Existing chemical inventories and planned procurement of chemicals falling within the scope of the Process Safety Management standard are monitored and tracked using the HMIS database. An Office of Safety and Health Protection staff member periodically reviews the status of reportable quantities of those listed chemicals and compares them against chemical inventories, which includes interim or long-term storage of usable

chemicals. One of the listed chemicals is bulk quantity acids, which factored into the chemical incompatibility and reaction in the Hanford explosion. Capability of knowing where these type chemicals are being used/stored enables ORNL to maintain an effective level of awareness.

The HMIS has 30 to 40 regulatory lists that can be used to query against the hazardous material inventory system (can query by control area, building, site, division) to determine if inventories have pure chemicals or ingredients in tradename products which are on the list. The HMIS has the peroxidiazable list from the National Safety Council and the Occupational Health and Safety Act (OSHA) 1910.119 appendix A list of toxic and reactive highly hazardous chemicals included in the regulatory lists. Divisions can monitor the shelf life of chemicals on these lists.

The MSDS module assigns hazard ratings for health, fire, and reactivity (fire and reactivity are assigned according to National Fire Protection Association (NFPA) criteria). The HMIS inventories can be queried by the reactivity rating assigned by the MSDS module.

The HMIS maintains an excess materials list that is available for use on the World Wide Web to all employees. Materials which are added to the list is determined by the custodians of the control areas.

HMIS sends an e-mail when a new material enters a control area that has not been ordered in the last year to a division selected person(s).

HMIS has a facility safety report that can provide a list of materials (materials that have Reportable Quantity and Threshold Quantity) that have reached an authorized limit based on quantities in a given building.

HMIS tracks chemicals to the point of being declared waste. HMIS was designed to interface with the waste system. The custodian of the control area must choose one of five codes to remove HM from his inventory (CONS-consumed or use up in a process, WAST-disposed of as waste, EMIS-emitted through a stack, EMBO-embodied or becomes another product, SHIP-shipped off-site) in order to support a waste interface.

Within the Waste Management and Remedial Actions Division (WMRAD) the handling, safe and environmentally compliant storage and disposal of hazardous chemicals and waste is conducted in accordance with a series of WM-SWO-401 procedures maintained in the Hazardous Waste Operation Manual. The procedures are based on applicable and relevant requirements found in 40 CFR, Protection of the Environment; Chapter 1200-11-1, “Hazardous Waste Management” promulgated by the Tennessee Department of Environment and Conservation; and, the 49 CFR Transportation. Where reservation or

site level requirements have been established that affect the handling, safe and environmentally compliant storage, and disposal of hazardous chemicals and waste, those requirements have been integrated into the procedures by which Hazardous Waste Operations Group (HWOG) conducts operations. In addition to conducting operations in accordance with federal, state, and local requirements, HWOG has implemented best management practices (BMP) that go above and beyond regulatory or reservation administrative requirements.

The process of handling, safe and environmentally compliant storage and disposal of hazardous chemicals and waste begins with a request for disposal from a generator. HWOG technicians will coordinate with generators to confirm the identify of the materials they will be receiving and to prepare to receive the waste into inventory in a manner that meets all compliance-related requirements. Chemical compatibility assurance begins at the time the generator initially requests disposal through the HWOG. Once a waste is found to meet the waste acceptance criteria for the receiving facility and is received into inventory, it is actively managed through daily inspections and immediate correction to off-normal conditions. Disposal of the waste material occurs only after the chemical composition is confirmed and an appropriate disposal outlet is available. The readiness of off-site disposal facilities is rigorously monitored. Deviations from readiness criteria will restrict the availability of an off-site disposal outlet. On-site disposal facilities are subjected to the same rigorous management that on-site waste storage and treatment facilities are subjected to.

WMRAD follows site procedure OSHP-001, ORNL Hazard Communication (HAZCOM) Program, which outlines training, storage, and handling of hazardous materials.

1.3 Management Systems

ORNL's processes for the safe use, storage, and disposal of hazardous chemicals are addressed in the ORNL Directives and Guidance system. Current, primary procedures in this system that address this subject include: ESP-ESH-16, ORNL Hazardous Materials Inventory Program; OSHP-001, ORNL Hazard Communication (HAZCOM) Program; OSHP-002, Program for Health and Safety Hazard Management; OSHP-003, The ORNL Laboratory Standard Program; IS-3.1, Chemical Laboratory Safe Practices; ORNL=s WM procedures that specify the waste acceptance criteria and waste generator responsibilities; and WMRAD=s WM-SWO-401, Hazardous Waste Operations Manual.

The following outlines the current major elements and features of the these processes and procedures:

I. PURCHASE AND USE

A. Hazardous Materials Inventory System (HMIS)

Inventory listing
Regulated lists and thresholds
MSDS usage
Industrial Hygiene involvement
Control Areas
Area Custodians
Options for shelf life and excess materials

B. ORNL Divisions

HAZCOM coordinators
Environmental Protection Officers
Division Safety Officers
Laboratory Stewards
Chemical Hygiene Plans and Chemical Hygiene Officers
Experiment/Project Summaries and Reviews
Continuing self-assessment and walkdowns

C. Safety and Health Evaluation Support Team (SHEST)

Hazardous waste operations and response
Service subcontractor work activity

D. Oversight

Office of Environmental Protection
Office of Safety and Health Protection
Office of Operational Readiness and Facility Safety
Triennial ESH&Q Integrated Management Assessment

II. WASTE HANDLING AND DISPOSAL

A. Generator

Recognition of known or potentially hazardous wastes;
Waste minimization;
Completion of applicable portions of UCN-2109 Request for Disposal;
Coordination of Health Physics surveillance, as required;
Proper labeling of waste containers; and,
Proper inventorying and management of waste containers until custody is

transferred to the Hazardous Waste Operations Group (HWOG).

B. Hazardous Waste Operations Group

Review the UCN-2109 Request for Disposal submitted by the generator;
Confirm the waste is hazardous;
Determine the hazard class of the incoming waste;
Confirm waste packaging and labeling is suitable for transportation from generator site;
Coordinate and oversee waste pick-up and transfer;
Receive, store, treat wastes , and/or process wastes;
Inspect and conduct surveillance of the waste while in the custody of HWOG; and
Maintain proper documentation of the management of the waste.

C. Document Management Center

Maintain up-to-date records of hazardous waste activities;
Maintain original copies of documentation associated with a waste item received by HWOG; and
Maintain hazardous waste database and generator reports.

D. Office of Environmental Protection

Maintain regulatory overview of hazardous waste operations;
Prepare permit applications and modifications when necessary;
Conduct periodic audits to verify operational compliance with regulatory requirements; and
Provide regulatory liaison with federal and state regulatory agencies.

E. Office of Radiation Protection

Provide radiological surveillance and health protection support to HWOG.

F. Plant and Equipment Division

Provide equipment and loading/unloading services to HWOG for accumulation of hazardous waste from generators;
Provide on-site transportation service of hazardous wastes; and
Provide personnel and equipment to support transportation of wastes from ORNL to East Tennessee Technology Park or the Y-12 Plant.

G. Lockheed Martin Transportation and Packaging Management

Conduct surveillance of HWOG waste classification;
Ensure off-site hazardous waste transportation is conducted in accordance with USDOT regulations;
Review uniform hazardous waste manifests prior to shipment;
Inspect shipments after loading for transportation; and
Perform Federal Motor Carrier Safety Regulation inspections.

H. Security

Perform 24 hour surveillance to ensure the ORNL site and hazardous waste facilities are secured.

I. Waste Management and Remedial Action Division Training Department

Prepare and provide training programs required by federal and state regulations for personnel working in hazardous waste operations; and
Maintain personnel training records and documentation.

III. IDENTIFICATION AND TRACKING OF WASTE

Tracking of waste, including legacy waste, is performed by the Waste Management and Remedial Action Division=s ORNL Waste Tracking System. This system serves as the primary repository for waste information for ORNL.

FEEDBACK

The Lessons Learned and Occurrence Reporting systems provide mechanisms for feedback of experience into hazardous chemical use, storage, and disposal.

1.4 Identifying Unneeded, Excess Chemicals and Substitutes

The determination of the least hazardous, effective chemical is performed during the planning stage of the project or experiment in consultation with technically knowledgeable personnel.

ORNL's Office of Environmental Protection (OEP) has periodically conducted site-wide surveys for unneeded, excess materials. These surveys were prompted by DOE HQ requests and were conducted to identify compliance concerns, identify alternative users, and/or identify disposition plans for those materials. The surveys identified small amounts of unneeded, excess chemicals at ORNL.

ORNL's OEP maintains regulatory compliance programs for hazardous and/or mixed wastes. The programs encompass both generator areas and treatment, storage, and disposal (TSD) units. Periodic surveillances are conducted to verify compliance. Proper identification of wastes and/or hazardous wastes, which may include unneeded, excess chemicals, is part of the surveillance function. Additionally, generators are encouraged to find alternate users for unneeded, excess chemicals in order to minimize waste generation.

HMIS provides users the ability to borrow chemicals from others. HMIS has a World Wide Web page which lists materials excessed for reuse. The custodian of the material is responsible for placing materials on the list. The HMIS Office also conducts queries of HMIS inventories across the three Oak Ridge sites upon request by the divisions and internal oversight groups and provides information on who has the HM to the requestor. This includes hazardous materials such as asbestos, aerosols, and lead.

The Between Use Storage (BUS) areas and the Swap Shop are identified in the March 1997 Oak Ridge National Laboratory Pollution Prevention Program Plan as efforts to reduce hazardous, radioactive and mixed waste streams. The Hazardous Materials Inventory System also works to control the number of chemicals by maintaining current inventories and prompting those responsible for the chemicals to 1) minimize quantities and 2) designate excess as available for other users.

The primary mission of the BUS Area is to conserve the resources of research divisions by reducing the number of partially used chemicals that are declared waste within a division.

BUS Areas are also designed to fulfill various cost and time saving functions:

BUS Areas provide more efficient chemical management thereby reducing the amount of HMIS inventory time and safety compliance time in each laboratory.

- BUS Areas reduce the cost of projects by providing free chemicals to laboratory personnel.
- BUS Areas reduce the amount of time people spend ordering chemicals and necessary equipment .

ORNL has piloted two BUS Areas. A five month pilot BUS Area was opened in the Metals and Ceramics Division in May 1995. Over the five month period, 600 chemicals that were not currently being used were place in the BUS Area.

Once the concept of the BUS area was tested, ORNL expanded the effort. There are currently three operating BUS Areas at ORNL: Metals and Ceramics, Physics Division, and one in the Plant and Equipment Division (P&E). There are seven more BUS Areas

scheduled to open in P&E by the end of calendar year 1998.

Waste Management's Generation Interface organization has also facilitated the identification of surplus chemicals during their routine support of waste generators. They, in conjunction with the Pollution Prevention Program staff, transfer clean, unopened chemicals from areas where they would become waste to potential users. This reduces the overall chemical purchase and site inventory.

The success and ease of the above described programs (BUS and Swap Shop) are the primary incentives for employees to become involved. Chemicals obtained through either avenue are free to the user. Additionally, the administrative requirement to update HMIS inventories is a negative incentive to keep the inventories as low as possible.

The Pollution Prevention Program supports the routine review of all hazardous chemical uses to determine if safer substitutes can be made. As an example, virtually all solvent parts washing operations have been converted to aqueous processes. Similarly, wet chemical, photographic processes are being converted to digital where no waste is produced at all.

The waste management reengineering effort at ORNL identified the need for a centralized chemical stockroom. This is scheduled to be implemented within the next two years and will substantially reduce the chemical purchases, inventories and the associated hazards.

Normally there are no excess chemicals within WMRAD. Bulk chemicals are used regularly in process and are exhausted well before their storage life is reached. If any hazardous chemicals are generated, then they are disposed of per ORNL procedures for handling and disposing of hazardous wastes.

1.5 Program for Safe Management of Chemicals

As a research and development institution, ORNL has a large variety of chemicals on site, but generally they are in smaller, laboratory quantities and rarely exceed reporting quantities. Thus, the potential for significant releases of hazardous material from the laboratories is minimal. However, the potential for injury to employees is dependent upon (among other things) the types of materials used and not necessarily the quantity. One mechanism that the research divisions of ORNL use to evaluate these hazards is the experiment/project ES&H summary or review. Depending on the detail of the required summary, it may ask if alternative materials or the use of reduced quantities has been examined. New projects are also required to have National Environmental Policy Act (NEPA) reviews that ask similar questions.

Divisional Chemical Hygiene Plans address the use, storage, and review of chemical stocks. For instance, the Chemical Hygiene Plan for the Chemical and Analytical Sciences Division (CASD) has a section that addresses periodic checks of stocks to determine if the materials are needed. Also, for example, the quarterly ES&H inspection of CASD specifically looks for materials that might be waste or might become unstable with age.

1.6 Performance Measures

Performance indicators of several different operating parameters are maintained and reported by Waste Management and Remedial Action Division to ORNL. Some of the parameters measured include waste inventory reduction of each waste type present at ORNL; waste certification efficiency in the form of waste rejection rate from the Waste Examination and Assay Facility; and others. However, there is no performance monitoring specifically of elimination of excess chemicals. The status of detected vulnerabilities that have been recorded as findings is tracked through several systems, including WMRAD's internal finding tracking system. Through these systems, vulnerability reductions can be monitored.

1.7 Work Planning

The Safety and Health Evaluation Support Team (SHEST) serves the Oak Ridge National Laboratory (ORNL) as a multi-disciplined team focused on identification, evaluation, and control of on-site risks associated with construction activity, hazardous waste operations and emergency response, and service subcontractor work activity. Through partnering with the customer for bottom line protection of worker safety and health in these activities, this service will be provided in a manner that strives for continuous improvement, timeliness, and added value while supporting the research and development mission of ORNL.

1.8 Chemical Compatibility

ORNL's generators and Treatment, Storage, and Disposal (TSD) operators verify container compatibility (i.e., the waste is suitable for storage in the container) before putting a waste into the container. Additionally, wastes are checked for compatibility prior to adding wastes to a container. Incompatible wastes are segregated by physical separation and/or diking to ensure mixing of incompatibles will not occur if a waste is spilled. ORNL-level procedures for generators of hazardous or mixed wastes define the management standards for those wastes, including the above compatibility checks.

Compatibility checks are also included as required preventative procedures in ORNL's permitted waste storage and treatment operations per the requirements of the Resource Conservation and Recovery Act (RCRA). Those compatibility checks have been incorporated in training programs and in the operating procedures for the permitted units. Long term storage of waste is identified in Section 2 as a possible vulnerability.

1.9 Natural Phenomena

East Tennessee is exempted under RCRA from having to evaluate seismic hazards for permitted TSDs, because the region is not seismically active. All of ORNL's TSDs have been evaluated against potential for flooding and run-on for precipitation events. All storage units are designed and operated to eliminate the potential for run-on. None of ORNL's container storage units are located in 100-year flood plains. Portions of ORNL's Solid Waste Storage Area (SWSA) located in the 100-year flood plain; however, active disposal of hazardous or mixed wastes ceased in 1986. RCRA-mandated inspections are conducted at SWSA 6 so that any problems associated with flooding would be promptly identified and appropriate corrective actions taken.

1.10 Tank Level Monitoring

Waste
Bulk storage tanks for Liquid Low-Level Waste, Process Waste, and chemicals (such as sodium hydroxide and sulfuric acid) are provided continuous level measurement with remote alarming capability. Waste tanks with secondary containment are also provided with sump level measurement alarms to detect potential leaks. Personnel take periodic readings on tank levels and have developed responses in procedures in case a tank shows a potential loss of material. Walkdowns of the waste treatment plants (Bldgs. 3544, 3608) are done daily to examine diked areas for signs of leaks, check tank levels, etc. Weekly inspections of diked areas are also performed to see if any sign of degradation of aboveground storage tanks or the diked areas has occurred or if any evidence of a leak can be seen.

Mixed Waste
Building 7830A is the only active waste tank managed by HWOG. Changes in tank level are evaluated for safety significance in accordance with procedure. Tank 7830A is a 5,000-gallon stainless steel tank used to store mixed waste. The tank is positioned in a below-grade concrete vault that is lined with stainless steel. The stainless steel liner, which has a capacity of 5300 gallons, provides secondary containment for the tank. The floor of the liner is sloped to a 20-gallon sump that is equipped with a liquid sensor to detect any leaks, spills, or liquid releases into the secondary containment. The liquid sensor is monitored remotely around the clock in the Waste Operations Center (WOC) located in Building 3130. HWOG supervision will be notified in the event that a liquid

sensor alarm is initiated. Upon notification, HWOG personnel will take appropriate action to diagnose and remedy the condition causing the liquid sensor alarm.

Tank level is monitored during inspections and during transfer operations. Unexplained tank level changes are reported to HWOG supervision for diagnosis and resolution.

Inactive Tanks

Seventeen inactive Liquid-Low Level Waste (LLLW) tanks within the Surveillance and Maintenance program are monitored for liquid level changes. The data is entered into a computer database for tracking and trending. Several of these tanks are monitored on a continuous basis.

LLLW tanks, including the inactive tanks, are under the Federal Facility Agreement Tank Compliance Program. Inactive tank characterization information is provided in the *Waste Characterization Data Manual for the Inactive LLLW Tank Systems at ORNL and the Risk Characterization Data Manual for Category D Inactive LLLW Tank Systems at ORNL.*

1.11 Hazardous Chemical Walkdowns

At ORNL, the Office of Environmental Protection (OEP) maintains oversight programs to protect the environment and ensure compliance with environmental regulations. OEP has implemented an Environmental Protection Officers (EPO) program to communicate environmental regulations and requirements down to division staff. OEP provides basic compliance training to EPOs through monthly meetings and other communications. The EPOs assist division staff in the identification, characterization, segregation of wastes, and management of potential hazardous materials. Identification of potential hazardous situations are made through inventories, environmental inspections and surveillance, and divisional self-assessments and/or walkdowns.

There are many examples of how the EPO program acts as a conduit for informing other divisions/offices/programs on how to avoid potential problems at our site but also ones that occur nationwide. In monthly meetings or other communiques, the EPOs are informed of issues that surface across the DOE complex. Topics that are covered with the EPOs include inspection results from DOE sites, legal cases affecting DOE operations, reports of fines and penalties issued, and/or safety issues related to wastes. A recent example involved Idaho National Engineering Laboratory where they received

large fines for RCRA violations. Violations that could happen to us if we become less diligent, such as failure to keep accurate records, unlabeled containers, inadequate secondary containment, etc. Some other instances involving our EPOs and our internal (ORNL) lessons learned network would be the efforts to implement the court-ordered Sink and Drain Survey, the Stack and Vent Survey, and Storm Water Pollution Prevention measures. The EPOs are directly involved and contribute greatly to the success of ORNL in meeting regulatory deadlines, permits, and pollution prevention goals. Another example of a local (Oak Ridge Reservation) lessons-learned, is the "speculative accumulation" issue identified at Y-12. OEP worked to inform our EPOs on how to avoid that happening here.

The HMIS coordinator stays informed on facility chemicals listed in HMIS as well as bulk storage chemicals not listed in HMIS. A weekly inventory sheet is filled out on the bulk chemicals to determine when reorders need to occur. In addition, personnel performing Management By Walking Around (MBWA) activities regularly review HMIS lists at facilities and look for chemicals that may have been left by maintenance personnel or other organizations within WMRAD facilities.

Hazard assessments relating to operational or research handling, storage, or disposal of shock-sensitive or reactive chemical compounds/mixtures are performed by Office of Safety and Health Protection staff review of, and input to safety work permits, project safety summaries, and explosives request authorizations. These formal mechanisms of evaluating hazards cause identification of effective engineering, administrative, and personal protective control measures for employees.

Liquids

Liquid waste facility managers perform weekly MBWA evaluations of facilities and look for any unidentified chemicals in the facilities. The safety authorization basis documents primarily address and identify bulk storage chemicals at the facilities and identify the quantities as the maximum capacity of the tankage. Additional bulk storage tankage would require Engineering support and would require prior approval under the configuration change program, which includes identifying any impacts on approved safety basis documentation. Bulk inventory checks are made weekly and documented to the HMIS coordinator. Bulk storage tankage is monitored real-time and alarmed in the control rooms in case of a large loss of material.

Small, laboratory quantity chemicals are screened out as Standard Industrial Hazards within the safety authorization basis. Operations using these chemicals are covered by operating procedures or work instructions.

Hazardous Waste
As part of WMRAD Self-Assessment Program (SAP), self-assessments are conducted each year for requirements from twenty (20) to thirty (30) various source documents (e.g., Operational Safety Requirements (OSRs), RCRA Permits, Tennessee Rules, 40 CFR, and Conduct of Operations) and checked for proper implementation in the operating procedures. Methods for conducting the self-assessments include: field observations, walkdowns, document reviews, and interviews.

Walkdowns and facility assessments of hazardous waste facilities are conducted routinely. In the event unidentified chemicals or hazardous chemicals not included in the HMIS inventory were detected, appropriate action would be taken to discard the chemical or identify the owner of the chemical. However, detection of unidentified chemicals or hazardous chemicals not included in the HMIS inventory has not occurred at WMRAD facilities

Radioactive Waste
Facility assessments and walkdowns are conducted on a routine basis to verify the conditions of operation for each radioactive solid waste facility. These assessments evaluate limiting conditions and the potential for or actual occurrence of a noncompliant situation or event. The activities conducted during the assessments and walkdowns include activities to evaluate the integrity of waste containers; to validate hazardous materials inventories, as applicable; to evaluate possible radioactive and chemical hazards; and to evaluate the overall condition of the facility itself. No hazardous chemicals have been determined as a result of any facility assessment or walkdown that were not previously identified on data form set packages provided by the generator and used as the basis for each facility's safety assessment and documentation.

Surveillance and Maintenance Facilities
The shutdown facilities at ORNL under the Surveillance and Maintenance (S&M) Program were reviewed as a result of the Red Alert issued following the Hanford explosion. The review included review of safety documentation, use and storage of hazardous materials, S&M activities to mitigate explosive atmospheric buildup, and potential hydrogen buildup in demineralizer resin columns.

1.12 Waste Container Identification and Use

ORNL has implemented administrative controls for waste characterization. For example, ORNL has implemented training programs for waste generators to ensure wastes are properly segregated, identified and categorized. ORNL has also implemented a Waste Certification Program per DOE Order 5820.2A to ensure that wastes are properly characterized and meet the receiving facility's Waste Acceptance Criteria (WAC).

Specially-trained generator interface staff have been appointed to assist generators with waste characterization. Waste management staff review generator characterization to ensure it is accurate and complete and to verify the wastes meet the WAC. The WAC define the permit conditions for the various TSDs.

Procedures for receiving chemical waste are based on the facility authorization basis (FAB) for the receiving facility. HWOG staff reviews waste characteristics for compatibility using the hazardous waste compatibility chart developed by the American Society for Testing and Materials (ASTM) Committee D-34 or the list in Tennessee Rule 1200-1-11-.06, Appendix .06/B, Examples of Potentially Incompatible Waste; and 40 CFR Part 264, Appendix V, or other chemical reference books to ensure proper handling and segregation of wastes to be stored. Specific parameters used to evaluate container compatibility include, but are not limited to, the following: (1) chemical characteristics (ignitability, corrosivity, and reactivity); and (2) presence of solvents, ketones, alcohols, or other constituents that would damage the container or liner.

Materials in waste containers are identified in a number of ways. Generators are considered the best source of readily available information about the contents of a waste container. Generators provide process knowledge at the time that the chemical is declared a waste and disposal is requested. Analytical data is also used to identify the contents of a waste container. Using process knowledge and/or analytical data, a determination is made as to what constitutes proper storage and handling. Waste identification and classification guidance is provided in HWOG's procedure WM-SWO-401.1. The recent occurrence (ORO-ORNL-X10WSTEMRA-1997-0001) of a drum shipment exceeding Department of Transportation (DOE) limits for radioactive material is currently under evaluation.

Federal regulations define incompatible waste as "a hazardous waste which is unsuitable for: (1) placement in a particular device or facility because it may cause corrosion or decay of containment materials (e.g., container inner liners or tank walls); or (2) commingling with another waste or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes, gases, or flammable fumes or gases."

As discussed in the *Hazardous Waste Operations Manual* (WM-SWO-401) and RCRA permits governing the Hazardous Waste Operations Group's (HWOG's) waste storage facilities and in accordance with 40 CFR 264.172 as incorporated by reference at Tennessee Rule 1200-1-11-.06(9)(a), the HWOG uses a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.

Also, in accordance with 40 CFR 264.177 as incorporated by reference at Tennessee Rule

1200-1-11-.06(9)(a), the HWOG ensures that: (1) incompatible wastes, or incompatible wastes and materials, are not placed into the same container and (2) hazardous wastes are not placed in an unwashed container that previously held an incompatible waste or material.

In accordance with 40 CFR 264.177 as incorporated by reference at Tennessee Rule 1200-1-11-.06(9)(d), the HWOG also ensures that a storage container holding a hazardous waste that is incompatible with any waste or other materials stored nearby in other containers must be separated from the other materials or protected from them by means of a dike, berm, wall, or other permanent device.

The hazard designation for a waste is based on the generator's process knowledge of the waste stream (known constituents, known chemical or physical properties, known processes, etc.), analyses of the waste stream, or a combination of both. For wastes received in the containers in which they were originally purchased/received, the basis for designation will be generator information and the container label. For other wastes, information provided by the generator on the Waste Item Description (WID), UCN-2109 form or equivalent is evaluated by HWOG staff to determine whether laboratory analyses are needed. It should be made clear that generator-provided information for much of the legacy wastes in storage at HWOG facilities is weak or vague, at best. The present disposal request forms, which require much more data and information to be provided, are a result of the forward progression of waste management as a whole.

Specific parameters used to evaluate container compatibility include, but are not limited to, the following: (1) chemical characteristics (ignitability, corrosivity, and reactivity); and (2) presence of solvents, ketones, alcohols, or other constituents that would damage the container or liner.

Any waste added to a container must be compatible with the container and its existing contents. Compatibility of new wastes to be stored with existing inventory in a storage area/cell/cabinet/container/unit will be reviewed by HWOG personnel. HWOG staff reviews the information provided by the waste generator on the WID form, or an equivalent, to determine the correct waste code. Based on the waste's chemical and physical properties, HWOG staff designate the appropriate storage area/cell/cabinet/container/unit for the waste, given the nature of the other wastes that already stored there and the type of containment provided. Generators' process knowledge is also utilized to ensure that incompatibilities are not stored or placed together or placed in an unsuitable containment system.

All equipment used to transfer waste is compatible with the waste. Containers are constructed of, or lined with, materials compatible with the wastes. Only new/unused or cleaned (if used previously) containers will be used for waste transfers to prevent

accidental contact with residues of potentially incompatible materials. When smaller containers are packed into DOT drums, a mixture of clay absorbent, vermiculite, or other suitable absorbent (relatively inert materials) will be placed into the drums as packaging material to help prevent breakage of containers and to provide an absorbent medium in the event of spillage within the drum. Only packaging materials compatible with the wastes are used. Incompatible wastes are not placed in the same container. Steel drums are constructed of either carbon or stainless steel. Polyethylene liners (4-mil) are used to contain many liquid wastes that would be incompatible with carbon- or stainless-steel drums. Engineering texts indicate polyethylene is resistant to attack by oils, chlorinated organics, and nonchlorinated organics. Special care is taken during handling, packaging, transporting, transferring, and storing to segregate incompatible wastes.

Polyethylene lined drums are also sometimes used for storage of acidic waste. The recent event of the overpacked poly drum at Paducah was considered relative to this use. Three factors indicate little risk from this hazard at ORNL: (1)poly-lined drums with acidic waste are routinely inspected and periodically repackaged; (2) there is no trend of a problem with ORNL's storage; (3) acidic waste drums are being shipped to East Tennessee Technology Park.

At least a minimum waste characterization necessary to ensure safe handling, regulatory compliance, compatibility and waste acceptance is required before a waste is transferred to a HWOG storage unit. These include: radioactivity, pH, and primary constituents.

HWOG staff reviews waste characteristics for compatibility using the hazardous waste compatibility chart developed by the American Society for Testing and Materials (ASTM) Committee D-34 or the list in Tennessee Rule 1200-1-11-.06, Appendix .06/B, Examples of Potentially Incompatible Waste; and 40 CFR Part 264, Appendix V, or other chemical reference books to ensure proper handling and segregation of wastes to be stored.

Mixing of incompatible waste is also prevented by requiring generators to provide information based on their process knowledge, testing, or a combination of both. Generators describe the waste contents and characteristics. The compatibility review completed by HWOG staff as an element of the waste acceptance ensures that incompatible wastes will be handled properly. HWOG staff ascertains compatibility using waste handling history, references listed, and other literature data.

Facility designs and operating procedures also minimize the probability that incompatible wastes will be mixed. Incompatible wastes will be separated by diking (including portable dikes) or other means of segregation (including open-top overpack drums).

Incompatible wastes may be stored at the HWOG facilities; however, incompatible

wastes are not placed in the same container and containers are segregated to prevent accidental mixing. Before any waste is placed into an empty container, the container is examined carefully to ensure it is clean. HWOG Field Operations personnel are trained in the proper handling of hazardous waste, including the importance of not adding an incompatible waste to a partially filled container. Wastes are mixed only after the contents of each container are verified and if it is known from experience or from an evaluation of chemical properties that the wastes are compatible.

Segregation of incompatible wastes and incompatibility barriers are two items of inspection performed on a daily and weekly basis, respectively.

Temperature is controlled in the hazardous waste storage bays in Building 7653. High/Low temperature alarms are set at 90°F and 45°F respectively. The environment within the storage bays is thermostatically controlled to remain in the mid-70s. In the event of an electrical power supply outage, the environmental control system servicing the storage bays is supported with an auxiliary power unit (APU). The APU is capable to providing adequate power to ensure continued available of critical systems.

1.13 Over-Pressure Protection

Over-pressure protection is installed on all pressure vessels within LGWOS facilities. These pressure vessels were identified during a prior walkdown of the sites a few years ago and the relief devices are on programmed maintenance recall with Quality Engineering and Inspection (QE&I) personnel at ORNL. Other over-pressure devices on transfer piping in the Liquid Low-Level Waste (LLLW) System and on steam control stations are tested prior to installation by QE&I and are not retested (per the QE&I program).

Over-pressure protection of the hazardous waste storage tank at Building 7830A is provided and consistent with the authorization basis for the facility. The devices providing over-pressure protection are inspected daily for effectiveness in accordance with TDEC's permit which regulates tank operations and maintenance.

The HWOG has not identified any drum(s), container(s), or tank that is currently in need of over-pressure protection. In fact, due to RCRA regulations and the nature of the chemical hazards in storage (i.e., poison-inhalation hazards[PIHs], etc.), the HWOG does not use over-pressurize protection devices such as relief valves on waste containers. However, for those situations when a container is identified as bulging and/or pressurized, the group is equipped with hydraulic devices to remotely puncture the lid of an open-top drum or unscrew the threaded cap of a bung-opening drum. Most of the HWOG's waste storage facilities are temperature controlled, which aids the prevention of drums, containers, and tanks from becoming pressurized. Containers with a high

probability of rupture from over-pressure are repackaged, and not overpacked, so not to interfere with visual inspections.

QA procedure X-GP-16, “Procurement of Critical Applications/Safety Class Items and Services at ORNL,” is the procurement method to make purchases, including pressure vessels. Procurement procedure PC-165, “Divisional Technical Review of Procurement Documents at ORNL,” requires an additional overview to determine "critical items" i.e. pressure vessels are procured per ASME. Vendors are qualified in accordance with their ASME stamp issued by the National Board. Major vendors appear on the LMES SQIG (Supplier Quality Information Group) list. Once a pressure vessel inspected on site is completed the user contacts the QC arm of QA to enter the vessel in their maintenance and inspection database. Thereafter inspections are scheduled and performed in accordance with ASME requirements by qualified QC inspectors. More detail is provided in the procedures that are available on the World Wide Web.

2. VULNERABILITIES

A review of known vulnerabilities was conducted by ORNL and reported in attachment to the letter from J. H. Swanks to Edward G. Cumesty dated November 14, 1997. (This report is attached). The scope included chemical and radiological vulnerabilities at the ORNL site identified in recent years by DOE, the Defense Nuclear Facilities Safety Board (DNFSB), and by contractor self-assessment. These vulnerabilities have been documented and entered into corrective action programs and implementation plans. Significant progress on the mitigation of the identified vulnerabilities has been made in many areas, notably the reduction of unneeded chemicals, the near-term removal of sodium and lithium hydride, progress on the plutonium vulnerability actions, shock-sensitive perchlorate removal, and major risk reduction achievements at the Molten Salt Reactor Experiment. In the interim as corrective actions are implemented for the vulnerabilities, appropriate surveillance, maintenance, and controls are applied such that the safety of the workers and public is ensured. Additionally, waste storage tanks were reviewed for possible chemical reactions. Integrity and safe operation of waste tanks is ensured by appropriate waste acceptance criteria and implementation the Tank Compliance Program under the Federal Facility Agreement. Follow up reviews of waste tank reports have been identified for action. Additionally, earlier this year there were high concentrations of perchlorates identified in the hot cell exhaust ductwork of the shutdown building 3019-B.

As a result of this initiative directed by Secretary Peña and the review of waste management operations, WMRAD has identified the following possible vulnerabilities:

Existing waste characterization data are inadequate for determining the most appropriate treatment, storage and disposal options for waste streams and for assessing chemical compatibility.

The necessary waste characterization data to support decisions on proper waste management processing for some wastes is not available. In addition to treatment storage and disposal of waste, improved characterization data is important for assuring chemical incompatibilities are avoided while wastes are in process. Some Low-Level Waste (LLW), considered legacy, has accumulated in storage facilities for which radiological characterization data is lacking or minimal. Additional characterization will be required before disposition can occur.

Unproven waste/container compatibility

Compatibility of containers (and all outer containers) for low-level mixed waste, wastewater treatment sludges, and Contact-Handled Transuranic (TRU) waste has not been proven.

Compatibility of co-stored waste

Earlier standards for packaging, and packaging standards for today vary. During lab cleanouts conducted prior to 1989 various waste may have been combined that should not be co-stored.

Disposal of Mixed Shock-Sensitive Waste

Currently, no on-site treatment method for “mixed” shock-sensitive waste exists at ORNL.

Wastes are stored in facilities not designed for that purpose

Funding requested for some dedicated storage facilities has not been provided. Therefore, the use of available facilities has been required. Due to lack of environmental controls, drums could corrode, releasing chemicals to the environment and/or causing potential worker exposures.

Quantities of waste are stored long term.

The long term storage of waste could result in unanticipated vulnerabilities caused by container aging, chemical aging, and decomposition to unknown byproducts. The stability and compatibility of hazardous waste is considered at the point it is processed for receipt by HWOG. However, limited consideration is given specifically to the

possible degradation and destabilization that may happen with a chemical over an extended storage life. Wastes that have been in storage for extended periods of time that have become unstable would only be detected at the point that the destabilized form of the chemical causes a physical change to the waste's container. Movement, like shipment of mixed waste to East Tennessee Technology Park (ETTP), could exacerbate this condition.

Additionally, as described in section 1.1 of this report, ORNL has recently identified the following five opportunities for improvement that also support improvements in chemical safety performance.

1. Strengthen the DOE and ORNL line management roles and accountability for implementing environment, safety, and health requirements and initiatives.
2. Strengthen the ORNL compliance training qualifications programs.
3. Strengthen the DOE and ORNL self-assessment programs.
4. Establish an improved ES&H issues tracking management system to address the roles and responsibilities of various offices that fund work at ORNL.

Establish an ORNL Integrated Safety Management System (ISMS).

3. TECHNICAL COMPETENCE AND TRAINING

3.1 Facility Specific Training

A number of facilities at ORNL have implemented "facility specific" training programs that require successful completion for unescorted access. Examples include:

- General Employee Access Training (for access to reactor facilities)
- Melton Valley Area Access Training
- Hazardous Waste Operations Facility Orientation
- Liquid and Gaseous Waste Operations Facility Orientation
- Building 6000 Access Training
- Radioactive Materials Analytical Laboratory Facility Access Orientation and Safety Training
- Transuranium Research Laboratory Facility Access Orientation and Safety Training

3.2 Training Implementation Matrices

Reviews of the June 1996 version of the ORNL Training Implementation Matrix (TIM), ORNL/M-3582/R2, and the July 1996 version of the High Flux Isotope Reactor TIM were conducted by representatives of the DOE Site Office and Operations Office. Based on contractual and programmatic

changes at ORNL, the Site Office requested on August 6, 1997 that the TIMs be combined to ensure consistency as well as revised to address specific comments from the reviews. This revised and consolidated TIM was submitted to the Site Office on Oct. 2., 1997. The submittal will be reviewed by Site Office Staff in a timely manner and, through a cooperative effort, changes or additions will be effected to allow DOE approval.

The TIM defines and describes the application of the selection, qualification, certification, and training requirements of U. S. Department of Energy (DOE) Order 5480.20A for operable reactor and non-reactor nuclear facilities at ORNL.

3.3 Worker Training

The program for training facility workers on chemical hazards is defined by Office of Safety and Health Protection Procedure OSHP-001, "ORNL Hazard Communication (HAZCOM) Program. All new employees receive HAZCOM Awareness Training specifying employee rights under the HAZCOM Standard as part of the initial LMES/LMER General Employee Training program. Training of facility workers in facilities that use only laboratory quantities of hazardous chemicals is addressed by the ORNL Laboratory Standard Program, OSHP-003.

Employees working in areas with the potential for exposure to hazardous chemicals are targeted to receive General Hazard Communication Training covering (1) the HAZCOM Program, (2) use of MSDSs, (3) requirements for labeling, and (4) identification of basic physical and health hazards posed by exposure to chemicals. Employees working in areas with the potential for exposure to hazardous chemicals also receive additional job-specific training from supervisors (1) at the time of the initial work assignment, and (2) whenever a new chemical hazard is introduced into the assigned work area. Training objectives include:

A. Identification of the physical and health hazards associated with hazardous chemicals, with special emphasis on chemicals that are listed as carcinogenic.

B. Methods and observations used to detect the presence or release of hazardous chemicals (e.g., monitors, alarms, odors, appearance).

C. Procedures, techniques, and protective equipment provided to safeguard workers against exposures to hazardous chemicals.

D. Information on hazardous chemicals in the work area, including information on labeling, and access and use of MSDSs.

After general HAZCOM training, Division HAZCOM Coordinators and supervisors receive additional HAZCOM training concerning supervisory responsibilities required for implementing the HAZCOM Program.

Chemical hazard recognition and control is also represented in the initial and refresher training provided for workers involved in projects and activities under the scope of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, 29 CFR 1910.120.

Training program administration is supported by the ORNL System for Training Administration and Recordkeeping (STAR). STAR became the official repository of electronic training records at ORNL on October 1, 1997, following continued but inconsistent usage of the LMES Training Management System (TMS) after formation of LMER in January, 1996. Presently, some of the operating organization manage

training records with databases developed internally to support their specific needs. All corporate electronic training records, however, including those of the operating organizations, will be successfully consolidated into STAR by June 30, 1998.

STAR provides functionality for the identification of specific training requirements necessary for individual employee qualification, including those requirements for employees who work with or around hazardous chemicals. Those individual employee training requirements, called "baselines," previously defined in the LMES TMS have been successfully transferred to the STAR. Those individual requirements identified in operating organization databases will be included in the consolidation effort previously mentioned. When individual requirements are fully defined within the database, STAR also gives notice by electronic mail message to the Division Training Managers and Training Officers of the upcoming needs for retraining or of training requirements which have not been successfully completed.

4. LESSONS LEARNED AND OCCURRENCE REPORTING

The Oak Ridge National Laboratory (ORNL) has active programs to properly evaluate and disseminate information concerning reportable occurrences and lessons learned. This information is provided both internally to ORNL Staff and to other DOE personnel across the complex through the Occurrence Reporting and Processing System (ORPS) and through the DOE Lessons Learned Listserver. In addition, a variety of external information sources are queried on a regular basis to develop lessons learned for sharing within ORNL.

4.1 Lessons Learned

The ORNL Lessons Learned Program is managed through the Laboratory Assessment Program in the Office of Quality Services. The Lessons Learned program was implemented to:

- share good work practices and innovative approaches to promote repeat application and
- share adverse work practices and experiences to avoid recurrence.

These goals are met through a cycle of events which include input, validation, dissemination and utilization of Alerts. The Alert is merely the form used to capture the lessons learned. Each Alert is prioritized as either red, yellow, blue or green. Guidance concerning the criteria for each priority as well as the elements of an Alert is located in the DOE Standard entitled "Development of DOE Lessons Learned Programs," DOE-STD-7501-95.

The input phase begins the cycle. ORNL Procedure QA-16.3, "ORNL Lessons Learned and Alerts Program" gives each employee the authority to identify and originate Alerts from their work experiences. Subjects of Alerts may range from positive work practices which provide the basis of improvements, to issues or experiences having major negative impacts on environment, safety, health, or quality. In addition to internal sources, input may come from sources external to ORNL such as other DOE Lessons Learned Programs, product recalls, occurrence reports, etc. Regardless of the source, before Alerts are distributed through the Lessons Learned Program at ORNL, subject matter experts (SMEs) review them for applicability and technical accuracy. This validation process is essential to ensure that Alerts are pertinent and that the conclusions drawn are appropriate for ORNL.

Based on their knowledge of the ORNL organization, the nature and scope of the Alert, the Lessons Learned Program Manager (LLPM) along with the SME agree on a target audience to which the information is sent. Following internal dissemination and approval for external distribution, the Alert is sent to the DOE Listserver which gives other DOE sites access to the Alert. Electronic mail systems are used for both internal and external distribution.

The utilization of Alerts is the most important part of the cycle. Therefore, program managers and training officials are encouraged to incorporate lessons learned information into training programs, work planning sessions and safety meetings as appropriate. In addition, utilization may also take the form of corrective actions which may be developed and tracked as a result of distributing Alerts.

4.2 Occurrence Reporting

Goals of the ORNL Occurrence Reporting Program are: a) to notify DOE (Site and Headquarters) and other stakeholders of reportable events or conditions on the ORNL site, b) to find, fix, and prevent recurrence of problems through effective causal analysis, corrective actions, and trending, and c) to provide a vehicle for the sharing of lessons learned with other DOE contractors. Program administration is provided by an Occurrence Reporting Group as part of the Office of Quality Services. Requirements flowdown from DOE Order O 232.1 and associated Manual M 232.1-1 are incorporated in ORNL site level procedure ORNL-OR-001, "ORNL Occurrence Notification and Reporting" and associate guidance document ORNL-OR-G1, "ORNL Occurrence Notification and Reporting Guidance Document." These documents assure requirements for proper identification, categorization, notification, investigation, analysis, and reporting of occurrences are communicated to ORNL staff. The procedure and guidance document are posted on the internal web server utilized by all ORNL staff for communication of site level procedural guidance.

ORNL-OR-001 requires that ALL staff report immediately to line management or to the Laboratory Shift Superintendent's (LSS) Office any actual or potential adverse event or condition. The inclusion of potential adverse events allows ORNL management to review all abnormal events for near-miss implications or management concerns that might warrant reporting as occurrences. ORNL senior management has delegated responsibility and accountability for categorization, investigation, and reporting of occurrences to the Facility Managers.

ORNL-OR-001 provides guidance on notification of DOE concerning reportable occurrences. Verbal notification is accomplished, when required, via a "phone bridge" involving the DOE Headquarters Emergency Operations Center, the DOE-Oak Ridge Operations Emergency Operations Center, the responsible DOE Facility Representative, and the responsible ORNL Facility Manager, with the ORNL LSS serving as coordinator.

Verbal notification requirements for external entities such as the State Emergency Management Agency, the Environmental Protection Agency, the National Response Center, Local Governments, Local Emergency Planning Committees, Law Enforcement Agencies (Tennessee Highway Patrol, Federal Bureau of Investigation, etc.), and Lockheed Martin Corporation are also documented in ORNL-OR-001 and associated Guidance Document.

Investigation of occurrences is the responsibility of the facility manager. He/she may choose to conduct the investigation internally or may form a team of subject matter experts to aid in the investigation and analysis of the event. The analysis of the occurrence determines direct, contributing, and root causes, the corrective action plan, and lessons learned associated with the event or condition. Root cause analysis may be accomplished by a variety of techniques depending on the complexity and/or safety significance of the event or condition.

Dissemination of important information associated with the ORNL Occurrence Reporting Program is accomplished through the issuance of a monthly ORNL Occurrence Reporting News Bulletin. The bulletin is a web-bases document and contains hot topic information, occurrence report and corrective action status, and trending information concerning occurrences at ORNL.

Formal training for ORNL personnel concerning occurrence reporting consists of three specific courses; a) Introduction to Occurrence Reporting - teaches staff how to categorize occurrence, the occurrence reporting process, and roles and responsibilities, b) Preparation of Occurrence Reports - teaches staff the format of the DOE Occurrence Report and techniques for writing quality reports, and c) Investigation Techniques - teaches staff best practices for investigating occurrences, interviewing, critiques, and evidence gathering. Training is also available for root cause analysis and corrective action planning.

Data associated with all reportable occurrences are documented in the ORNL Laboratory Issues Database System (LIDS) for internal tracking and closure of corrective actions, assignment of risk scores, and trending with other ORNL issues.

Written notification reports are submitted to the DOE Occurrence Reporting and Processing System per the requirements of ORNL-OR-001. A review of Notification Reports for FY-97 at ORNL indicated that over 99% (115 of 116) were submitted by close of next business day as required by procedure.

As of October 1, 1997, there are 1,234 occurrence reports documented in the DOE Occurrence Reporting and Processing System (ORPS) related to Lockheed Martin facilities at ORNL. There are 46 open (non-finalized) reports of which 20 are awaiting final DOE approval. Eight of the 26 non-final reports within ORNL control are beyond the 45 calendar days allowed for submission of a final report. Each of the eight has an Update Report submitted summarizing the reason for delay and providing an estimated date for submission of the final report (per the provision of DOE M 232.1-1).

Two examples this year of reporting chemical safety occurrences were the discovery of a previously unknown and potentially hazardous chemical (lithium perchlorate) in a storage cabinet and discovery of decomposed, volatile mercury compound in a fume hood.

ATTACHMENT

STATUS OF KNOWN VULNERABILITIES AT ORNL